



Washington State Department of Fish and Wildlife

TECHNICAL APPLICATIONS DIVISION

Progress Performance Report
For
WSDOT Fish Passage Inventory

May 2004

FISH PASSAGE BARRIER REMOVAL PROGRAM



**Washington State Department
of Transportation**

This report is also available in a pdf format at: [http://www.wsdot.wa.gov/
environment/fishpass/state_highways.htm](http://www.wsdot.wa.gov/environment/fishpass/state_highways.htm).

Additional data can be obtained by contacting Fish and Wildlife Biologist, Eva Wilder, at the WDFW; e-mail wildeelw@dfw, phone: (360) 902-2411.

Table of Contents

| | |
|--|----|
| Introduction..... | 4 |
| Fish Passage Inventory | 4 |
| Fish Passage Inventory Upgrades | 6 |
| Regional Statistics | 7 |
| WSDOT Fish Passage Barrier Correction Plan | 15 |
| WSDOT Fish Passage Barriers Correction with Dedicated Funding | 15 |
| Six Year Planning Document | 15 |
| Fish Passage Project Scoping Process - Phase 1 | 16 |
| Fish Passage Project Scoping Process - Phase 2 | 16 |
| WSDOT Fish Passage Barriers Corrected with Dedicated Funding | 17 |
| Fishways | 17 |
| WSDOT Transportation Improvement Projects | 21 |
| Barrier Correction in the course of WSDOT Transportation Improvement and Road Construction Projects | 22 |
| Evaluation of Dedicated Funding Projects, Before and After Barrier Removal | 26 |

List of Tables

| | |
|--|----|
| Table 1. Estimated Number of Fish-Bearing Crossings, Fish Barrier Crossings, and Barrier Cross- ings Requiring Fish Passage Repair based on the WSDOT Expanded Inventory Fish Pas- sage Protocol. | 6 |
| Table 2. Fish Barrier Assessment in Six WSDOT Regional Management Areas | 7 |
| Table 3. Dedicated Funding Projects Completed through WSDOT/ WDFW Barrierl Removal Pro- gram. | 18 |
| Table 4. Summary of Proposed WSDOT Highway and Safety and Mobility Projects - Fish Barrier Inventory Efforts. | 21 |
| Table 5. Fish Passage Projects Complted Through WSDOT Transportation Projects and Other Fund- ing Sources..... | 23 |

List of Figures

| | |
|--|----|
| Figure 1. WSDOT Expanded Fish Passage Inventory Status | 5 |
| Figure 2. WSDOT Regions | 8 |
| Figure 3. WSDOT Northwest Region Fish Barriers, March 2004. | 9 |
| Figure 4. WSDOT North Central Region Fish Barriers, March 2004. | 10 |
| Figure 5. WSDOT Olympic Region Fish Barriers, March 2004. | 11 |
| Figure 6. WSDOT Southwest Region Fish Barriers, March 2004. | 12 |
| Figure 7. WSDOT South Central Region Fish Barriers, March 2004 | 13 |
| Figure 8. WSDOT Eastern Region Fish Barriers, March, 2004. | 14 |
| Figure 9. Silver Creek - Before Construction | 28 |
| Figure 10. Silver Creek - After Construction | 28 |
| Figure 11. Fletcher Creek - Before Construction | 29 |
| Figure 12. Fletcher Creek - After Construction. | 29 |
| Figure 13. Unnamed to Big Creek - Before Construction | 30 |
| Figure 14. Unnamed to Big Creek - After Construction. | 30 |
| Figure 15. Dalby Creek - Before Construction. | 31 |
| Figure 16. Dalby Creek - After Construction. | 31 |
| Figure 17. Upper Springbrook Creek - Before Construction. | 32 |
| Figure 18. Upper Springbrook Creek - After Construction. | 32 |
| Figure 19. Deer Creek - Before Construction. | 33 |
| Figure 20. Deer Creek - After Construction. | 33 |
| Figure 21. Unnamed to North Creek - After Construction. | 34 |
| Figure 22. Portage Creek - After Construction. | 34 |
| Figure 23. Martha Creek - Before Construction | 35 |
| Figure 24. Martha Creek - After Construction | 35 |
| Figure 25. Martha Creek - After Construction | 35 |

CD-ROM:

Appendix I. WSDOT Fish Passage Barriers Inventoried as of March 2004.

Appendix II. WSDOT Fishways Requiring Repair.

Appendix III. WSDOT Project Scoping for Scheduled and Unscheduled Projects.

Appendix IV. WSDOT Fish Passage Projects - Six Year Plan for Dedicated Funding.

Appendix V. Dedicated Project Evaluations - Adult Spawner Surveys - Levels I and II.

Introduction

Restoration of declining salmon and trout populations ranks high in the development of management plans for streams, lakes, and wetlands in Washington State. One of the major problems facing the salmon and trout populations is an inability to utilize their historic rearing and spawning grounds due to barrier culverts, blocking upstream habitat. The Washington Department of Fish and Wildlife (WDFW) and the Washington Department of Transportation (WSDOT), realizing this fact, have worked since 1991 to inventory and correct fish barriers at state highway crossings.

Prior to 1991, WSDOT addressed fish passage barriers as required by hydraulics permits issued for highway construction projects and through routine maintenance. In 1991, in cooperation with the Washington State Legislative Transportation Committee, WSDOT committed funding from its Highway Construction Program to develop an inventory of fish passage barriers to anadromous fish species at state highway crossings. WSDOT contracted with Washington Department of Fisheries (prior to the merger of Washington Departments of Fisheries and Wildlife) to conduct the inventory and habitat studies necessary to prioritize state route barriers for correction. A scientific approach is used to prioritize WSDOT fish passage barrier correction and to determine the quantity of reclaimed habitat. To date, WSDOT has spent over \$24.6 million to inventory, conduct habitat studies, prioritize, and correct fish passage barriers in Washington streams. As a result of those combined efforts, over 1,615,073 square meters of salmonid habitat, or, over 595 linear kilometers (369 miles) once blocked by barrier culverts has been reclaimed.

This report summarizes fish passage inventory updates, fish passage reviews for upcoming WSDOT road projects and the WSDOT barrier correction plan. WSDOT barrier corrections completed in 2003, long-term scoping and planning for future barrier corrections, and fish use evaluations of planned and completed fish passage barrier corrections are also reported.

Fish Passage Inventory

In 1998, the WSDOT contracted with the WDFW to commence an expanded inventory using the current fish passage criteria (*WDFW Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual 1998* revised in 2000). The current fish passage criteria have been expanded to include stream reaches with gradients up to 20% (in accordance with the Forest Practice Rules) that were not evaluated during the initial fish passage inventory (1992-1998). The expanded inventory is prioritized by Water Resource Inventory Areas (WRIA), using WSDOT road miles, estimated barriers to fix, stock status, stock mobility, and the number of native salmonid species present in each WRIA.

To date, the expanded inventory has been completed on 4,039 kilometers (2,510 miles) of state routes, or 33% of the total WSDOT highway system. Figure 1 outlines the expanded inventory progress in Washington State. The road-based, WSDOT fish passage inventory is expected to be completed within the next eight to ten years, utilizing two crews depending on funding. Habitat assessment and prioritization for all fish passage barriers are expected to be completed within 18 to 20 years utilizing one additional crew.

The results and estimates for the expanded WSDOT fish passage inventory are shown in Table 1.

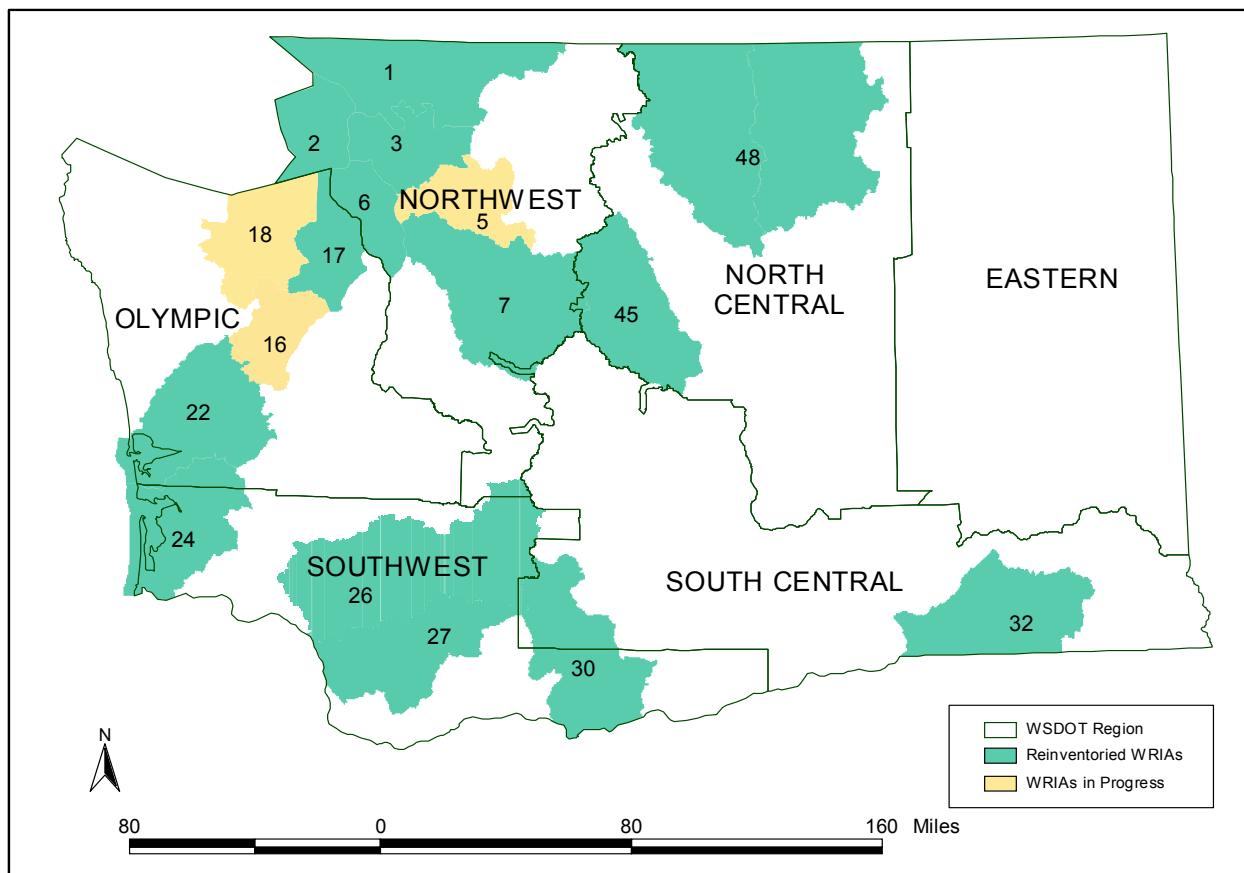


Figure 1. WRIAs inventoried during the Expanded Fish Passage Inventory since 1998.

The *WDFW Fish Passage and Diversion Screening Inventory Database* row includes data collected to date for the fish passage inventory of 4,039 kilometers (2,510 miles) of WSDOT highways, since the start of the inventory in January 1992. The *Extrapolated data* row estimates the number of fish barriers for the entire 12,324 kilometers (7,658 miles) of WSDOT road system, once the WSDOT fish passage inventory is completed.

Table 1. Estimated Number of Fish Bearing Crossings and Barrier Crossings Requiring Fish Passage Repair Based on the WSDOT Expanded Fish Passage Inventory.

| Source | Fish Crossings | Fish Barriers | Barriers Requiring Repair (with Significant Habitat Gain) | Barriers with Limited Habitat Gain ¹ | Barriers with Habitat Threshold Gain Not Determined | Barriers Fixed ² |
|---|----------------|---------------|---|---|---|-----------------------------|
| WDFW 2004 Fish Passage and Diversion Screening Inventory Database | 2,533 | 1115 | 754 | 251 | 110 | 124 |
| Extrapolated data ³ | 5,514 | 2,286 | 1,514 | 463 | | |

¹ Barriers that do not meet our current threshold habitat gain criteria to justify correction using dedicated funding until higher priority barriers are corrected.

² One hundred and twenty-four WSDOT fish passage barriers have been reported fixed; however, 16 of those require additional work to meet current fish passage criteria (see Table 3, Table 5).

³ The expected number of barriers to be identified during the expanded inventory is a result of updated barrier and habitat evaluation methods.

Fish Passage Inventory Upgrades

During the ongoing WSDOT inventory, 4,590 crossings in natural drainages have been inspected; 2,533 have been identified as fish bearing. Approximately 44% (1115) of the examined fish bearing crossings were identified as barriers (Table 1). Additionally, 138 crossings require further analysis to determine fish passage barrier status. Sixty-seven percent of those barriers (754), have significant habitat gain and have been prioritized for near-term correction, while 251 barriers with limited habitat gain will be considered for correction once the high priority barriers are corrected, or they may be corrected during road or maintenance projects. Another 110 fish barrier crossings are scheduled for verification of significant habitat gain. A complete list of all the WSDOT-owned fish passage barriers is included in Appendix I (CD-ROM).

For each identified WSDOT fish passage barrier, a habitat assessment is conducted to establish priorities for fish passage restoration. Three methods of habitat assessment are used; Full Physical Surveys, Threshold Determinations (TD), and Expanded Threshold Determinations (ETD), per the *WDFW Fish Passage Barrier and Surface Water Diversion Screening Assessment and Prioritization Manual* (August 2000, located on the Internet at: <http://www.wdfw.wa.gov/hab/engineer/fishbarr.htm>). The Full Physical Survey and ETD are used to qualify and quantify habitat, while the TD verifies a significant reach of habitat (200 m) exists both downstream and upstream of a barrier culvert crossing.

Regional Statistics

WSDOT has six geographic management regions: Northwest, North Central, Olympic, Southwest, South Central, and Eastern (See Figure 2).

The re-inventory process has been focused on the western part of the state; more than half of the Southwest and Northwest regions have been inventoried to date (See Figure 1 and Table 2).

Table 2. Fish barrier assessment in six WSDOT regional management areas.

| WSDOT Region | % Re-inventoried | Fish Bearing Crossings | Fish Barriers | Barriers Requiring Repair | Limited Habitat Gain Barriers | Barriers Repaired | Barriers Requiring Further Assessment |
|---------------|------------------|------------------------|---------------|---------------------------|-------------------------------|-------------------|---------------------------------------|
| Northwest | 53 | 815 | 407 | 265 | 105 | 48 | 37 |
| North Central | 42 | 165 | 71 | 55 | 10 | 6 | 6 |
| Olympic | 21 | 675 | 329 | 208 | 72 | 40 | 49 |
| Southwest | 62 | 608 | 248 | 182 | 55 | 18 | 11 |
| South Central | 11 | 148 | 26 | 19 | 3 | 5 | 4 |
| Eastern | 0 | 122 | 34 | 25 | 6 | 7 | 3 |
| Total | | 2533 | 1115 | 754 | 251 | 124 | 110 |

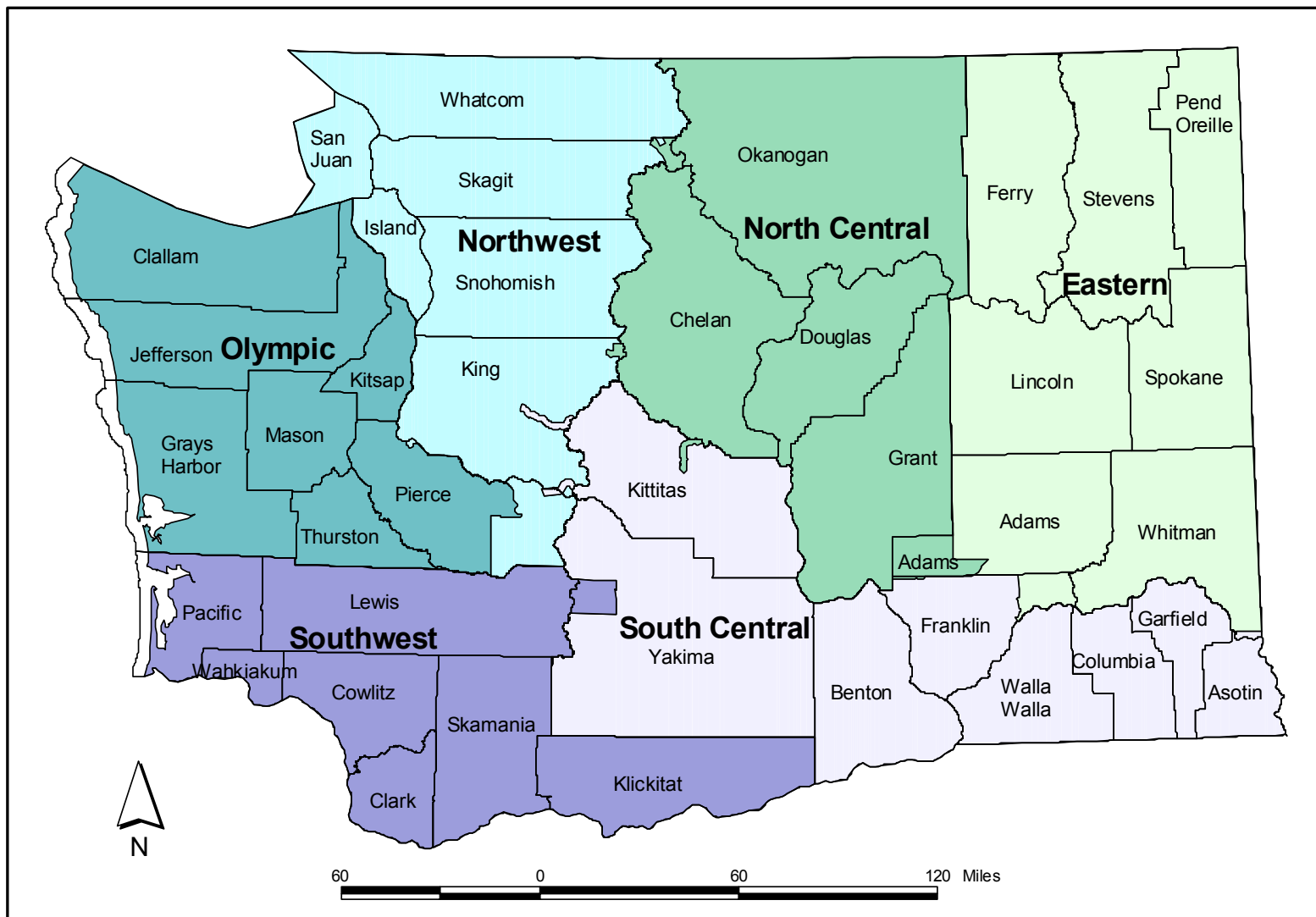


Figure 2. WSDOT Regions

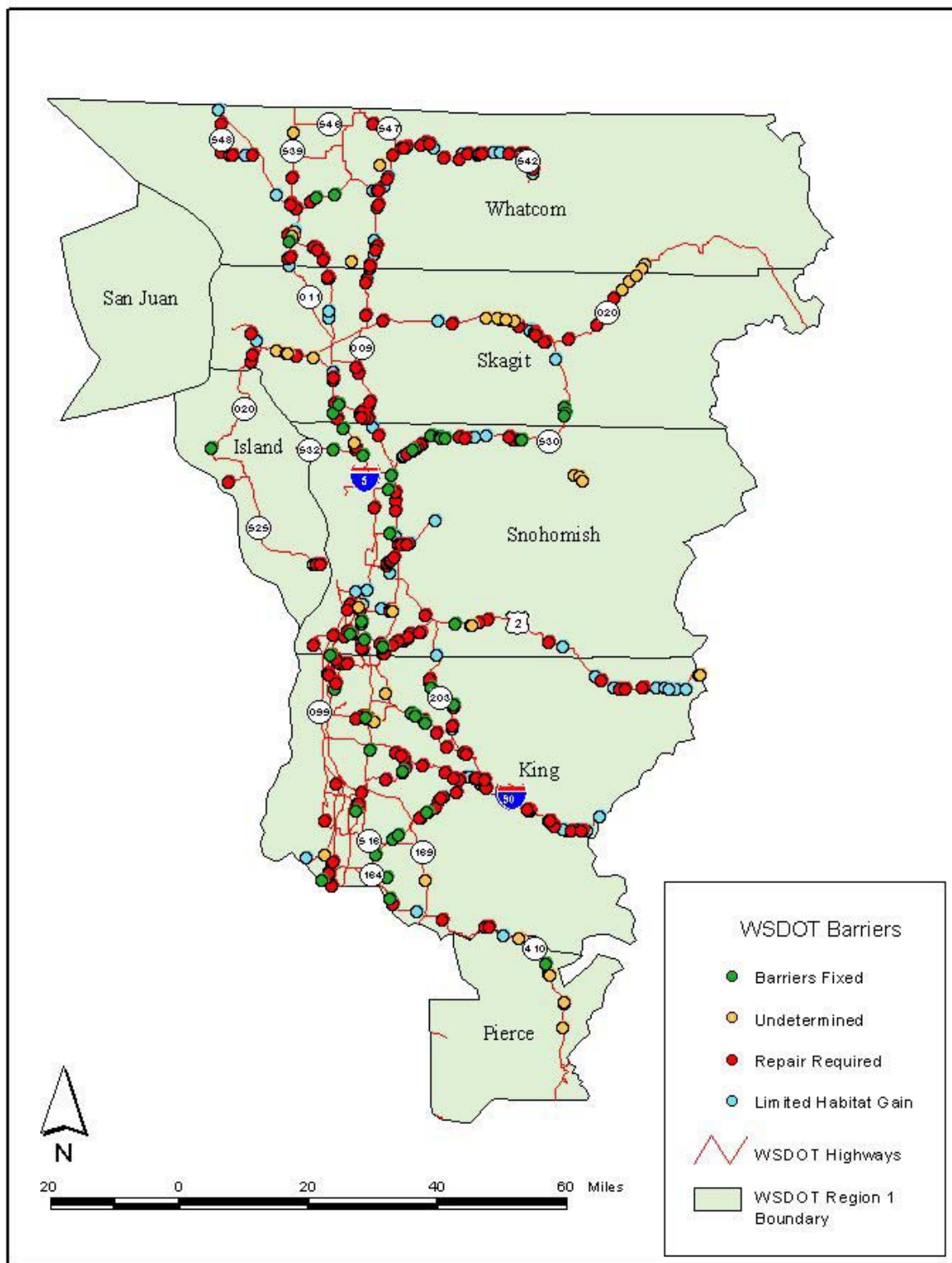


Figure 3. Northwest Region Fish Passage Barriers, March 2004.

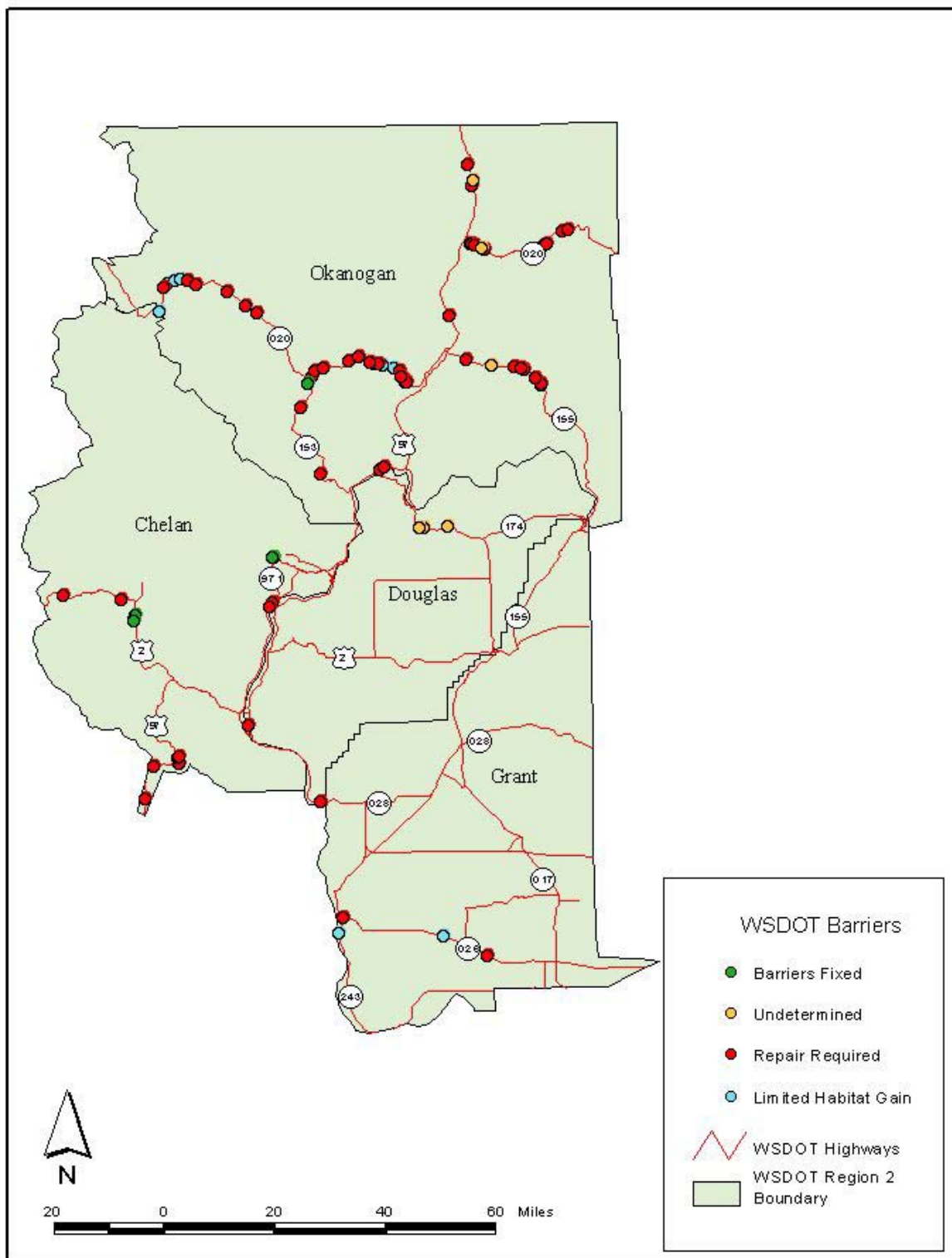


Figure 4. North Central Region Fish Passage Barriers, March 2004.

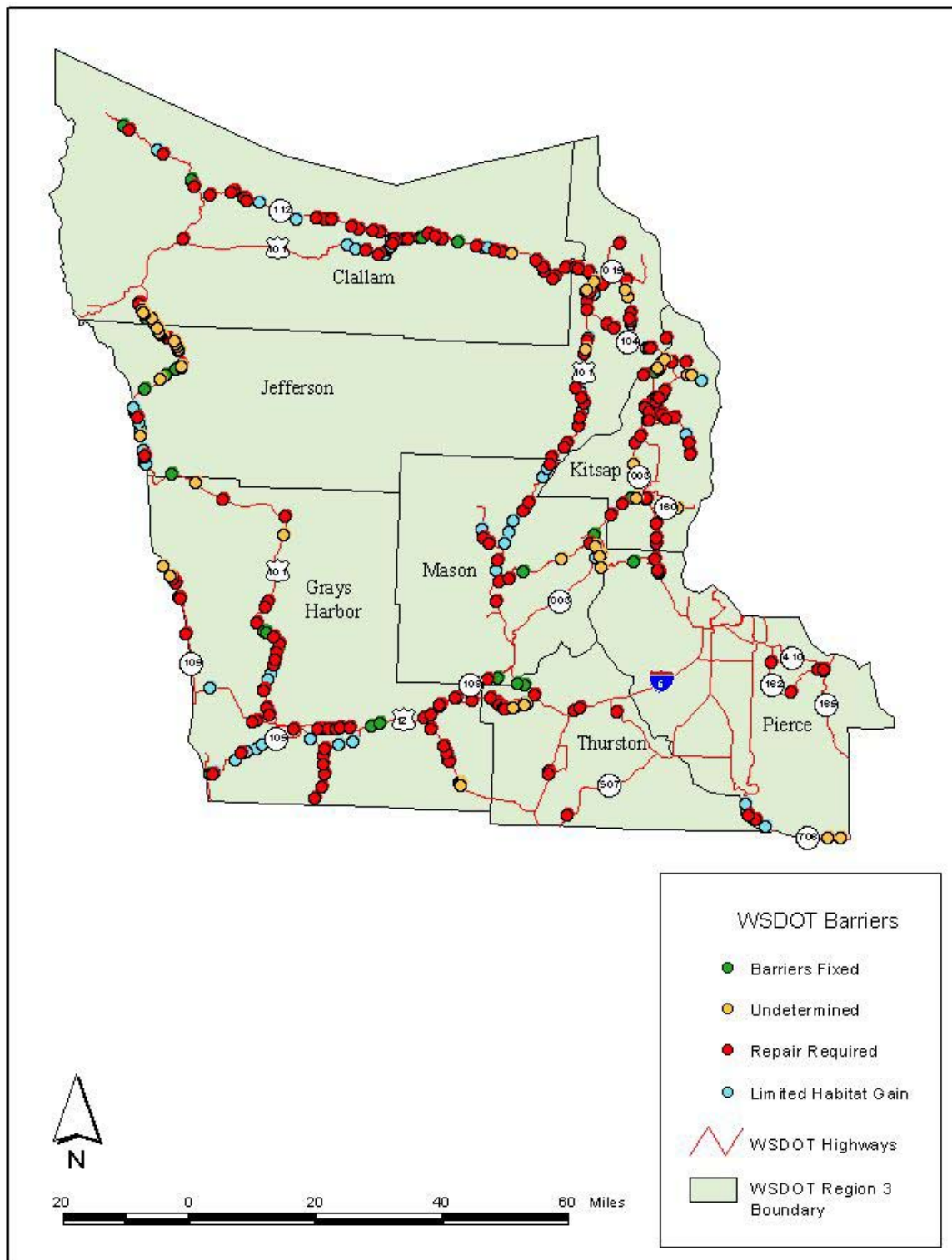


Figure 5. Olympic Region Fish Passage Barriers, March 2004.

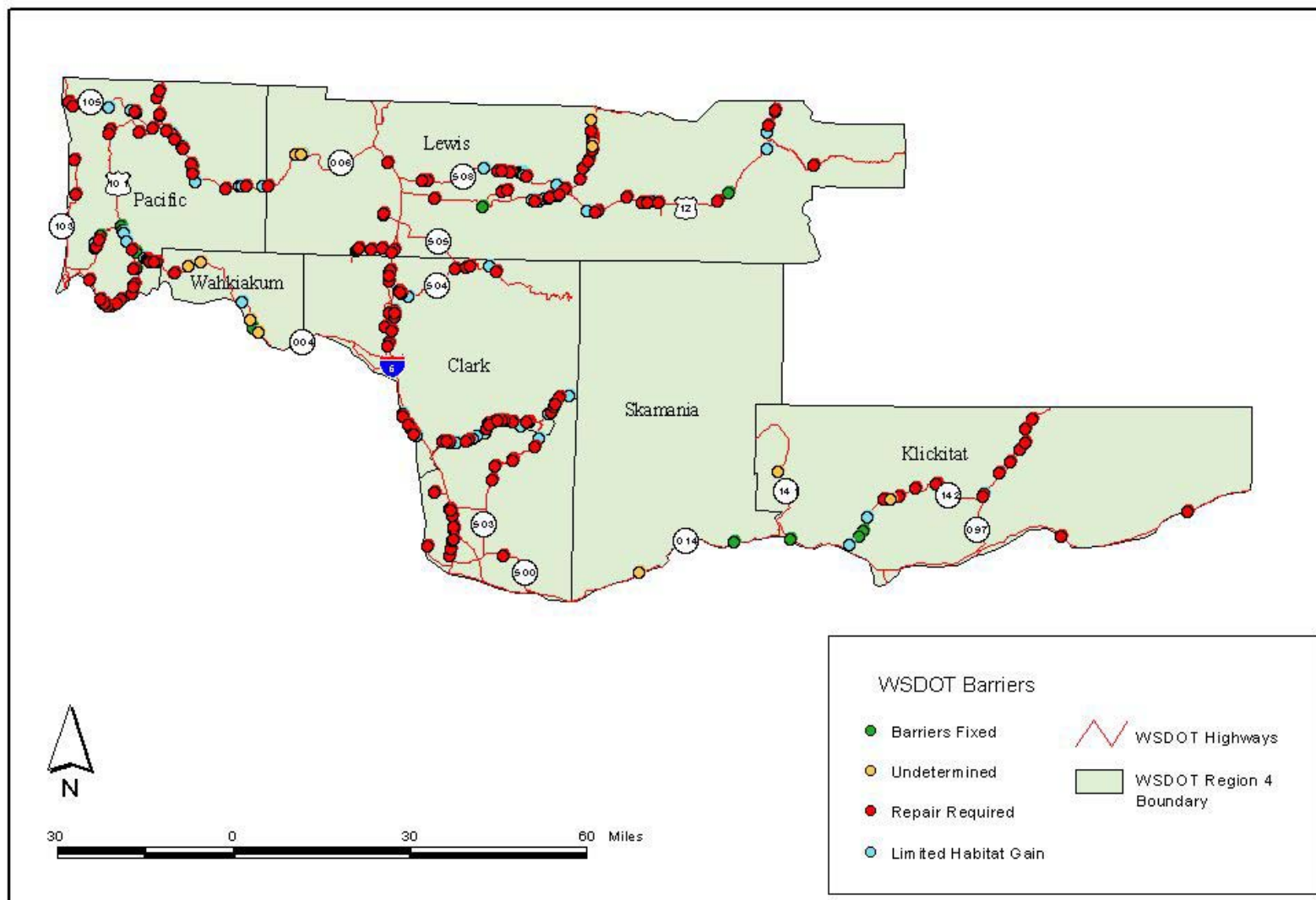


Figure 6. Southwest Region Fish Passage Barriers, March 2004.

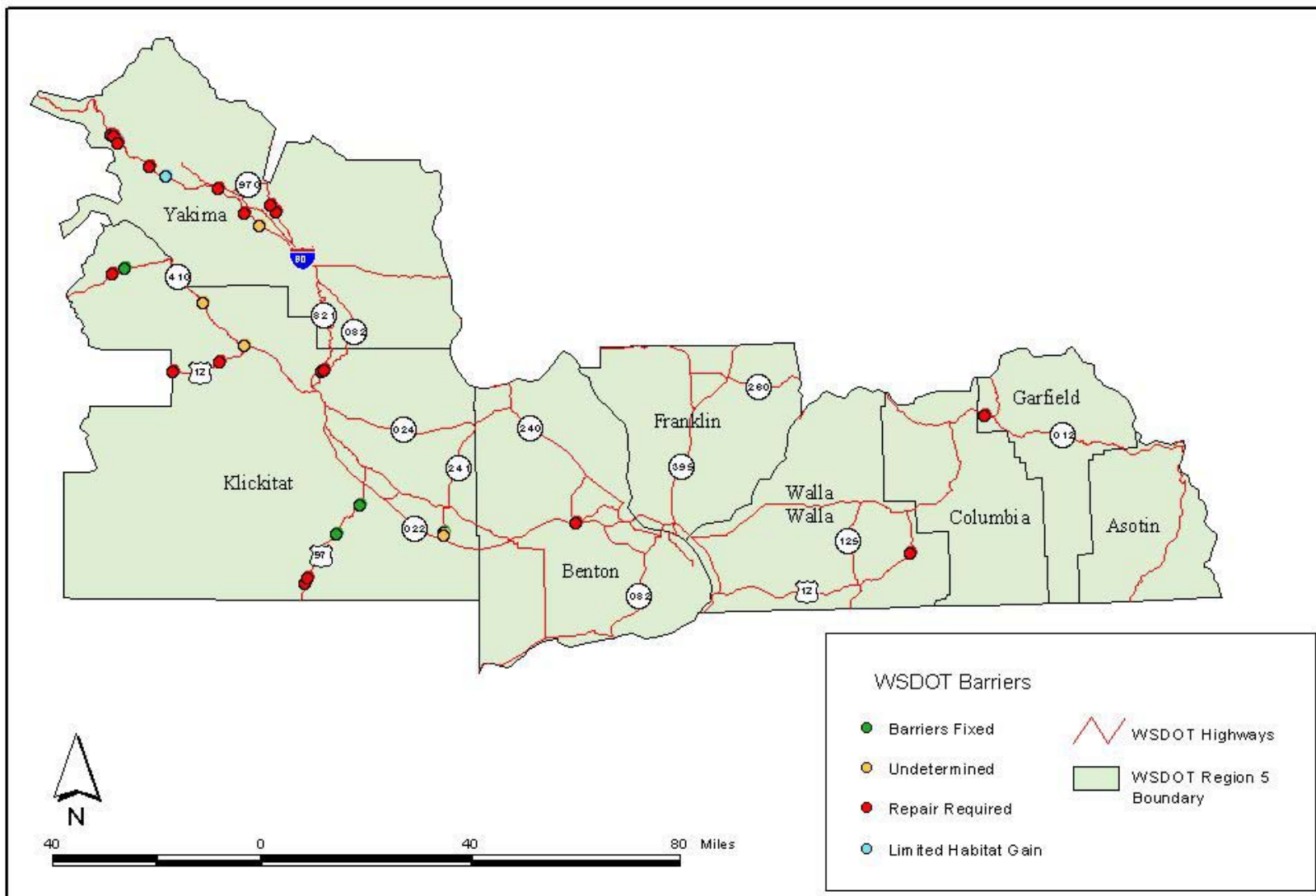


Figure 7. South Central Region Fish Passage Barriers, March 2004.

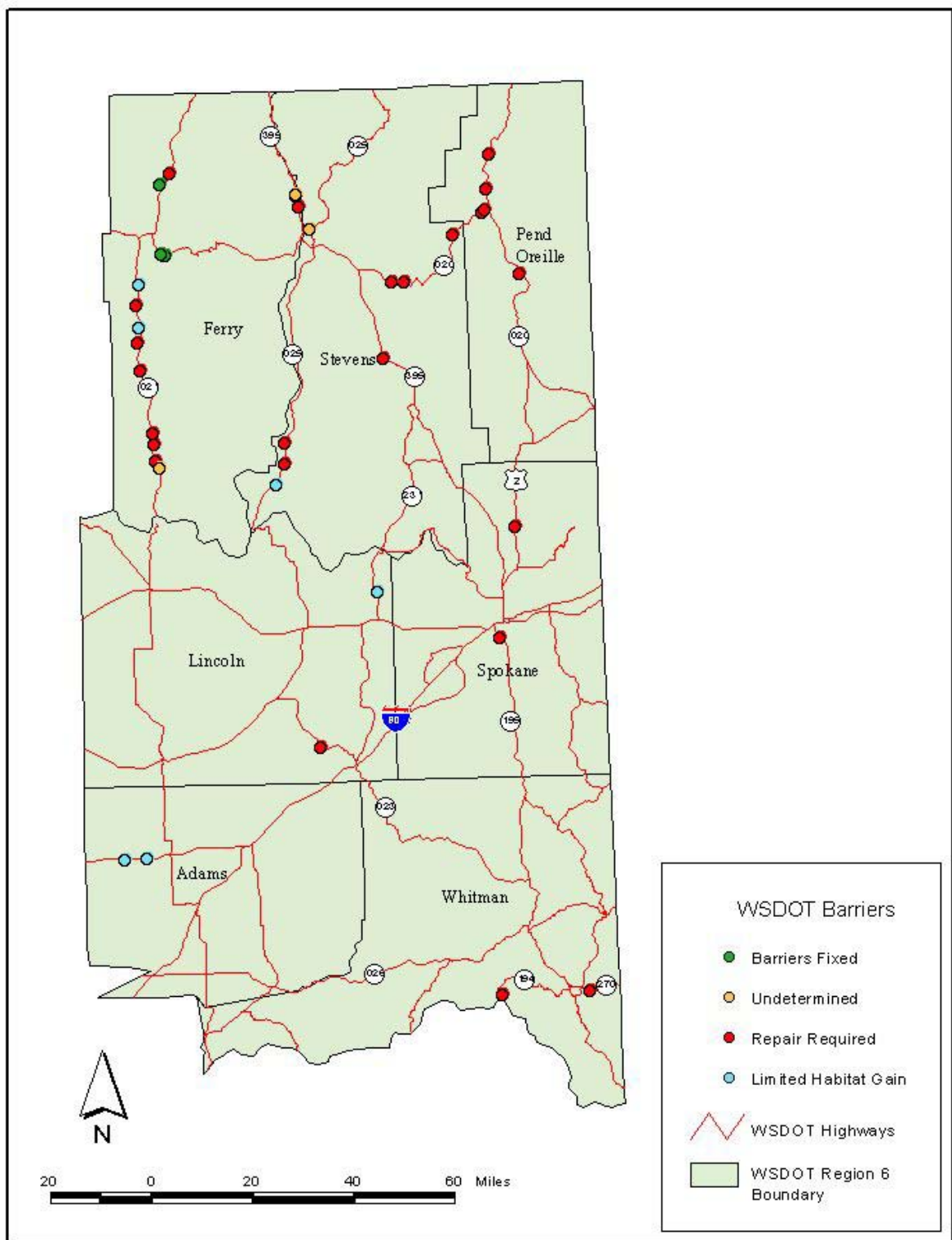


Figure 8. Eastern Region Fish Passage Barriers, March 2004.

WSDOT Fish Passage Barrier Correction Plan

WSDOT has been evaluating and correcting state highway fish barriers based on a Twenty-year Plan, using a three pronged approach. First, it designates dedicated (I-4) funding to correct the highest priority fish passage barriers within the Environmental Retrofit Program's *Six Year Plan*. Second, as road projects are constructed, additional fish passage barriers are removed whenever a Hydraulic Project Approval (HPA) is required. Combining fish passage restoration with road project construction decreases costs by eliminating duplication in mobilizing equipment and personnel. And third, some fish passage barriers are corrected as a result of routine maintenance of failing culverts.

This approach to salmonid habitat reclamation does not assume habitat will immediately be used by target salmonids. Many brood years may be required before newly opened habitat cycles up to full production. Fish management decisions, such as supplementation or harvest adjustments, may be needed. Additional factors, other than the loss of stream habitat caused by fish migration barriers, can affect fish production. Many other problems threatening salmonid habitat include non-WSDOT barriers, storm-water, pollution, agricultural diversions, hydropower, and general habitat degradation.

Fish passage problems in Washington are shared among federal, state, tribal, county, city and private owners. In Washington, WSDOT is responsible for an estimated 12,392 kilometers (7,700 miles) of highways, while counties and cities, for example, are responsible for an estimated 86,904 kilometers (54,000 miles) of roads. The 751 WSDOT-owned fish barriers currently identified as needing near-term correction block more than 1,367 linear kilometers (849 miles) of potential salmonid habitat. To realize potential habitat gain, other non-WSDOT barriers will also need to be prioritized and corrected.

Fish Passage Barrier Correction with Dedicated I-4 Funding

Each biennium dedicated funding within the WSDOT Environmental Retrofit Program (I-4) budget is set aside to provide for a sequential correction of high priority fish passage barriers identified during the WSDOT inventory. WSDOT and WDFW refer to this I-4 funding program as Dedicated Funding. Projects are prioritized to provide the largest gains in habitat and fish production. Among the many factors determining a project's priority are: the degree of passability improvement, species-specific production potential of the gained habitat, amount of habitat gained, benefits or drawbacks from increased mobility to species present, stock status of species present (WDFW Salmonid Stock Inventory, SaSI), and cost of the project. All the factors are consolidated in a numeric Priority Index (PI) model, ranking each project's relative priority, which includes production benefits to both anadromous and resident salmonid species.

Six Year Planning Document

At the request of WSDOT, WDFW has prepared a prioritized list of fish passage projects to be constructed and evaluated over the next three biennia. This list is the result of project evaluation, scoping, development of on-site engineering conceptual designs, and budgeting. The WSDOT Six Year Plan is included in CD-ROM. The Six Year Plan is regularly updated as projects are scoped and refined. Before a project is placed on the Six Year Plan, many phases of project

development are completed, referred to by WDFW as fish passage “project scoping”. WDFW biologists and engineers work as a team to develop projects. The project scoping occurs in two phases, described below.

Fish Passage Project Scoping Process - Phase 1

During monthly project scoping meetings, WDFW biologists present a summary of the key information collected in the inventory and habitat assessment effort for the highest priority fish barriers. The first step in the scoping process involves verification of inventory and assessment data and filling in any data gaps. Next, the WDFW biologists confirm completion of inventory work and prioritization effort for each barrier culvert and verify habitat conditions and species expected to benefit are correctly reflected in the PI for each barrier. In addition to the PI, other factors for fish passage project selection, such as additional human-made barriers in the watershed, project feasibility, likelihood for success, and project costs are also considered. All scoping information is summarized and a map is generated to show the location of additional human-made barriers located downstream and upstream of the WSDOT barrier. Once biological scoping is complete, projects that successfully meet the verification process will be recommended to be placed on the Six Year Plan. In some instances, projects are placed on hold until further evaluation work is completed.

For every WSDOT fish barrier recommended for the Six Year Plan, WDFW engineers conduct an engineering on-site field review with the WDFW scoping biologist and the appropriate WSDOT regional staff. They consider at least one conceptual design option for fish passage barrier correction and jointly generate an initial cost estimate for the project. Initial cost estimates are reported on the Six Year Plan and are intended to be used to request funding for further project development, engineering design, right-of-way acquisition, and construction. Project costs shown on the Six Year Plan may increase or decrease during subsequent years due to consideration of different design options, increased cost of labor and materials, increased vehicle traffic, land acquisition, or any other unforeseen factors.

WSDOT fish passage barriers are placed on the Six Year Plan when both the biological and engineering scoping is completed by WDFW, and the appropriate WSDOT regional staff have concurred with the conceptual design option and the cost estimate. Phase 2 project scoping occurs once the projects are placed on the Six Year Plan.

Fish Passage Project Scoping Process - Phase 2

When the WDFW is the project lead, WSDOT fish passage barrier correction planning is taken to the 80% design level, prior to development of the funding contract. The 80% design level is part of a scoping report that includes a description of the problem, design rationale, hydraulics and hydrology analysis, and other relevant calculations necessary to support the design. The scoping effort also includes a detailed cost estimate, which when approved, will serve as the platform for the final design and construction contract budget. WDFW submits the scoping report to the appropriate WSDOT region for review and approval. Once approved by the region, a copy of the approval letter is submitted, along with the construction contract, for processing by the WSDOT operations office.

When WSDOT is the project lead, the scoping report should be submitted to a WDFW environmental engineer for approval. Before applying for the required Hydraulic Project Approval, it is important to obtain an approved of the scoping report from a WDFW environmental engineer. It is most efficient to work with the WDFW fish passage technical assistance engineer, Pat Powers at (360) 902-2546.

Guidance for when WDFW or WSDOT will be project lead is based on the following criteria:

For projects that involve features and structures located outside of the roadway prism, such as instream grade control structures, project development and construction will typically be the responsibility of WDFW. Occasionally, WDFW engages in projects within the road prism exclusive of complete excavation of the road with associated traffic control.

For projects that involve work within the roadway prism and require a complete road excavation and a detour or other means of traffic control, project development and construction will generally be the responsibility of WSDOT.

For projects that involve work within and outside the roadway prism, WSDOT is the overall project lead. WDFW may design the culvert (size, type and placement) and the channel improvements, while WSDOT would design the roadway improvements to accommodate the new culvert, design the traffic control, assemble the plans, specifications and estimates, and administer the contract.

WSDOT Fish Passage Barriers Corrected with Dedicated Funding

Since the inventory began, fish passage barriers have been corrected by WSDOT and WDFW's Technical Applications Division (formerly the Environmental Restoration Division), using dedicated funding, at 55 high priority sites (see Table 3). Fish passage barriers corrected in 2003 include culvert replacement at Silver Creek (Figure 9 and 10), fishway construction at Fletcher Creek (Figure 11 and 12), and fishway tune up at an unnamed tributary to Big Creek (Figure 13 and 14).

Fishways

In addition to culverts, WSDOT owns and maintains 134 fishways statewide. Ninety-two of those fishways have been placed on a regular inspection schedule. Eighty of these fishways are currently considered durable and efficient, providing 100% fish passage. In cases where fishway upgrade is needed, fish passage is partially provided through continued operation and maintenance, and inspections are continued on a regular basis. Twelve partial barrier fishways are the on a regular inspection schedule with the understanding that the structures will be repaired in the future to provide 100% fish passage. Fishways that are total barriers to fish passage and can not be improved by continued operation and maintenance are taken off the inspection schedule until corrections are made. Twenty-nine such fishways await barrier resolution (see Appendix II). As new fishways are discovered through the inventory process, they need to be evaluated for fish passage and, if passable, placed on the inspection schedule. Thirteen fishways need to be evaluated for durability and efficiency.

Table 3. Dedicated Funding Projects Completed through WSDOT/WDFW Barrier Removal Program.

| Project Description | WRIA | Tributary To | PI | WSDOT Region | Highway | MP | Agency | Year | Cost (I-4 Funds) | Habitat Survey Length (m) | Habitat Gain (m ²) |
|---|-----------|------------------------|-------|--------------|---------|--------|--------|------|------------------|---------------------------|--------------------------------|
| Tumwater Cr Fishway | 18.0256 | Port Angeles Harbor | | Olympic | US 101 | 246.40 | WDFW | 1991 | \$18,356 | 1,440 | 6,158 |
| Fisher Cr Fishway | 03.0181 | Carpenter Cr | | Northwest | I-5 | 219.20 | WDFW | 1992 | \$20,000 | 1,430 | 28,376 |
| Evans Cr Fishway | 08.0106 | Bear Cr | | Northwest | SR 202 | 11.96 | WSDOT | 1992 | \$319,044 | 4,480 | 4,922 |
| Parish Cr Fishway | 15.0220 | Gorst Cr | | Olympic | SR 3 | 33.70 | WDFW | 1992 | \$14,834 | 1,600 | 7,594 |
| Green Cr Fishway Upgrade | 24.0341 | Willapa R | | Southwest | SR 6 | 8.90 | WSDOT | 1992 | \$8,000 | | 10,134 |
| Chuckanut Cr Fishway | 01.0626 | Chuckanut Bay | 38.28 | Northwest | SR 11 | 18.00 | WDFW | 1993 | \$68,788 | 2,680 | 22,565 |
| Unnamed Tributary Culvert Replacement | 07.0864 | Skykomish R | 19.23 | Northwest | US 2 | 18.00 | WSDOT | 1993 | \$60,000 | 1,726 | 7,669 |
| Squalicum Cr Fishway | 01.0552 | Bellingham Bay | 38.09 | Northwest | SR 542 | 3.50 | WSDOT | 1994 | \$68,000 | 4,745 | 16,567 |
| Bagley Cr Fishway | 18.0183 | Strait Of Juan De Fuca | 48.12 | Olympic | US 101 | 253.85 | WDFW | 1994 | \$42,306 | 10,450 | 33,970 |
| S Nemah R Fishway | 24.0503 | Willapa Bay | 34.34 | Southwest | US 101 | 29.80 | WDFW | 1994 | \$34,986 | 4,362 | 17,857 |
| Johnson Cr Fishway | 17.0301 | Port Williams | 28.17 | Olympic | US 101 | 266.50 | WDFW | 1995 | \$121,945 | 1,754 | 7,208 |
| Pussywillow Cr Culvert Replacement | 10.0048 | White R | 15.48 | Northwest | SR 164 | 8.30 | WSDOT | 1996 | \$100,000 | 5,738 | 5,092 |
| Grader Cr Fishway ¹ | 20.0237 | Bogachiel R | 24.48 | Olympic | US 101 | 189.40 | WDFW | 1996 | \$183,000 | 4,484 | 25,894 |
| Huelsdonk Cr Fishway | 20.0437 D | Hoh R | 24.69 | Olympic | US 101 | 171.70 | WDFW | 1996 | \$183,000 | 1,292 | 12,709 |
| Harlow Cr Fishway | 21.0134 | Queets R | 25.68 | Olympic | US 101 | 146.85 | WDFW | 1996 | \$96,000 | 5,525 | 33,156 |
| Rasmussen Cr Bridge | 19.0230 | Strait of Juan de Fuca | 15.42 | Olympic | SR 112 | 4.00 | WDFW | 1996 | \$603,000 | 1,325 | 6,023 |
| Ashley Cr Weirs | 08.0083 | Little Bear Cr | 14.24 | Northwest | SR 9 | 1.18 | WDFW | 1997 | \$24,264 | 1,800 | 4,210 |
| Unnamed Tributary Fishway and Culvert Replacement | 22.0052 | Fairchild Cr | 19.46 | Olympic | US 101 | 104.90 | WDFW | 1997 | \$207,206 | 5,462 | 16,164 |
| Kinnman Cr Culvert Retrofit, Baffles, and Roughened Channel | 15.0368 | Hood Canal | 28.95 | Olympic | SR 3 | 57.10 | WSDOT | 1997 | \$365,902 | 3,623 | 9,745 |
| Fairchild Cr Fishway and Culvert Removal | 22.0051 | Humptulips R | 20.30 | Olympic | US 101 | 105.60 | WDFW | 1997 | \$193,258 | 4,238 | 19,214 |

¹ Fishway is now a 67% barrier to fish passage due to an outfall drop of 0.46 m at the downstream end, developed as a result of downgrading below the fishway.

Table 3. (cont.)

| Project Description | WRIA | Tributary To | PI | WSDOT Region | Highway | MP | Agency | Year | Cost (I-4 Funds) | Habitat Survey Length (m) | Habitat Gain (m ²) |
|---|----------|---------------------|-------|---------------|--------------|--------|--------|------|------------------|---------------------------|--------------------------------|
| Church Cr Baffles and Fishway | 05.0021 | Church Cr | 33.70 | Northwest | I-5 (Old 99) | 216.70 | WDFW | 1998 | \$17,101 | 1,600 | 43,557 |
| Big Cedar Cr Baffles | 20.0576 | Pacific Ocean | 19.73 | Olympic | US 101 | 162.15 | WDFW | 1998 | \$122,998 | 2,351 | 11,036 |
| Steamboat Cr Fishway and Culvert Replacement | 20.0574 | Pacific Ocean | 27.53 | Olympic | US 101 | 162.60 | WSDOT | 1998 | \$23,000 | 7,434 | 51,530 |
| Unnamed Tributary Culvert Replacement | 22.0059 | SB Big Cr | 20.62 | Olympic | US 101 | 101.10 | WDFW | 1998 | \$249,305 | 3,811 | 9,960 |
| McDonald Cr Fishway | 14.0023 | Skookum Cr | 23.21 | Olympic | SR 108 | 8.90 | WDFW | 1998 | \$260,997 | 1,274 | 2,301 |
| Jewett Cr Culvert Replacement | 29.0342 | Columbia R | 10.20 | Southwest | SR 14 | 66.00 | WSDOT | 1998 | \$413,000 | 210 | 807 |
| First Cr Bridge | 47.0096 | Lake Chelan | | North Central | SR 971 | 8.90 | WSDOT | 1999 | \$265,000 | 200 | 4,200 |
| First Cr Bridge | 47.0096 | Lake Chelan | | North Central | SR 971 | 9.10 | WSDOT | 1999 | \$265,000 | 200 | 4,000 |
| Tibbetts Cr Fishway | 08.0169 | Lake Sammamish | 23.16 | Northwest | SR 900 | 19.50 | WDFW | 1999 | \$147,000 | 671 | 2,077 |
| Schoolyard Cr Fishway and Culvert Replacement | 05.0145 | Stillaguamish R | 21.32 | Northwest | SR 530 | 25.90 | WDFW | 1999 | \$350,000 | 1,280 | 3,477 |
| Unnamed Tributary Fishway ² | 21.0715 | Pacific Ocean | 15.49 | Olympic | SR 109 | 36.40 | WSDOT | 1999 | \$189,566 | 842 | 1,783 |
| Birnie Cr Fishway | 25.0281 | Columbia R | 30.28 | Southwest | SR 4 | 35.60 | WDFW | 1999 | \$67,570 | 3,924 | 35,766 |
| Beaver Cr Culvert Replacement | 48.0307 | Methow R | 37.85 | North Central | SR 153 | 29.28 | WSDOT | 2000 | \$554,000 | 96,354 | 165,674 |
| Unnamed Tributary Baffles and Grade Controls | 05.0065 | Pilchuck Cr | 42.03 | Northwest | I-5 | 211.50 | WDFW | 2000 | \$116,577 | 9,246 | 21,938 |
| Valley Cr Baffles and Roughened Channel | 18.0249 | Port Angeles Harbor | 33.07 | Olympic | US 101 | 246.90 | WDFW | 2000 | \$92,000 | 2,021 | 11,883 |
| Unnamed Tributary Culvert Replacement | 26.0429B | Stillwater Cr | 16.62 | Southwest | SR 506 | 2.33 | WSDOT | 2000 | \$99,000 | 1,502 | 4,672 |
| Kenyon Cr Fishway | 27.0320 | NF Lewis R | 24.07 | Southwest | SR 503 | 49.03 | WDFW | 2001 | \$224,000 | 1,456 | 15,170 |
| Birnie Cr Fishway | 25.0281 | Columbia R | 28.98 | Southwest | SR 409 | 3.85 | WDFW | 2001 | \$322,000 | 3,924 | 35,766 |

² Fishway is now a 67% barrier to fish passage. The downstream rock control is no longer backwatering and the drop at the fish entrance weir exceeds WDFW criteria for fish passage.

Table 3. (cont.)

| Project Description | WRIA | Tributary To | PI | WSDOT Region | Highway | MP | Agency | Year | Cost (I-4 Funds) | Habitat Survey Length (m) | Habitat Gain (m ²) |
|--|----------|--------------------|-------|---------------|---------|--------|--------|------|---------------------|---------------------------|--------------------------------|
| O'Brien Cr Bridge | 52.0394A | O'Brien C | 3.50 | Eastern | SR 20 | 310.06 | WSDOT | 2001 | \$906,000 | 1,4747 | 4,863 |
| O'Brien Cr Bridge | 52.0394A | O' Brien C | 4.31 | Eastern | SR 20 | 309.96 | WSDOT | 2001 | | 1,689 | 4,588 |
| O'Brien Cr Bridge | 52.0394A | O'Brien C | 6.29 | Eastern | SR 20 | 309.31 | WSDOT | 2001 | | 1,3410 | 49,935 |
| Skinney Cr Culvert Removal | 45.0701 | Chiwaukum C | 13.50 | North Central | US 2 | 87.10 | WSDOT | 2001 | \$1,441,000 | 3,061 | 5,782 |
| Skinney Cr Culvert Removal | 45.0701 | Chiwaukum C | 14.01 | North Central | US 2 | 87.67 | WSDOT | 2001 | | 3,543 | 6,693 |
| Skinney Cr Culvert Removal | 45.0701 | Chiwaukum C | 19.96 | North Central | US 2 | 88.03 | WSDOT | 2001 | | | 18,500 |
| Johnson Cr Bridge | 24.0581 | Naselle R | 28.74 | Southwest | SR 4 | 4.50 | WSDOT | 2001 | \$269,000 | 3,854 | 5,037 |
| Sweetwater Cr Culvert Removal | 15.0504 | Hood Canal | 10.53 | Olympic | SR 3 | 25.31 | WSDOT | 2001 | \$261,000 | 1,673 | 2,340 |
| Cement Cr Fishway | 24.0598 | Nasselle R | 36.55 | Southwest | SR 401 | 8.80 | WDFW | 2002 | \$200,000 | 6,464 | 15,957 |
| WF Hylebos Cr Fishway | 10.0014 | Hylebos Cr | 37.46 | Northwest | SR 99 | 6.86 | WDFW | 2002 | \$164,000 | 3,364 | 19,503 |
| Unnamed tributary Fishway | 03.0199 | Bulson Cr | 28.02 | Northwest | SR 534 | 1.2 | WDFW | 2002 | 686,000 | 7,932 | 36,405 |
| Coal Cr Log Controls Replacement | 08.0268 | Lake Washington | 34.58 | Northwest | I-405 | 10.20 | WSDOT | 2002 | \$128,000 | 8,240 | 35,330 |
| Fink Cr Culvert Replacement | 05.0257 | NF Stillaguamish R | 23.98 | Northwest | SR 530 | 44.00 | WSDOT | 2002 | \$312,000 | 7,329 | 33,726 |
| Moose Cr Culvert Replacement | 05.0257A | NF Stillaguamish R | 23.88 | Northwest | SR 530 | 44.27 | WSDOT | 2002 | | 6,681 | 31,076 |
| Silver Cr Stream Simulation Culvert | 26.0540 | Mayfield Lk | 33.83 | Southwest | US 12 | 81.22 | WSDOT | 2003 | \$527,000 | 6,788 | 42,143 |
| Unnamed Tributary Fishway | 22.0057 | Big Cr | 17.07 | Olympic | US 101 | 103.65 | WDFW | 1997 | \$96,175 | 3,434 | 11,009 |
| Unnamed Tributary Fishway Tune up | | | | | | | | 2003 | \$33,000 | 3,434 | 5,573 |
| Fletcher Cr Fishway | 20.0426 | Hoh R | 20.61 | Olympic | US 101 | 167.42 | WDFW | 2003 | 30,000 | 2,189 | 13,076 |
| Total Estimated Expenditure: | | | | | | | | | \$11,530,178 | | |
| Estimated Linear Habitat Gain (m): Based on habitat survey length only. Actual amount of habitat gain may be greater, due to different habitat survey methods and criteria used. | | | | | | | | | | 296,735 | |
| Estimated Area of Habitat Gain (m ²): | | | | | | | | | | 999,431 | |

WSDOT Transportation Improvement Projects

Integration of fish passage repairs with road project construction is a cost-effective way to accelerate barrier correction and reduce equipment mobilization costs. WDFW and WSDOT integrate fish passage barrier correction into planned WSDOT transportation improvement projects whenever possible.

Transportation project reviews take place at least one year prior to the anticipated construction dates to accommodate WSDOT transportation project long-range budgeting and planning requirements. Every odd year, WDFW requests and receives a list of proposed transportation projects from each of the six WSDOT regions. Transportation projects reviewed include Mobility (I-1 subprogram) and Highway Safety (I-2 subprogram) of the Highway Improvement Program as well as Other Facilities projects (P-3 subprogram) of the Highway Preservation Program. All the fish passage barriers inventoried during the Safety and Mobility reviews should be considered for correction, including barriers with limited habitat gain that are not considered for correction with Dedicated Funding.

This report includes the results of transportation project reviews conducted by WDFW in 1998, 1999, 2000, 2001, and 2003. The next reviews will take place during the Spring of 2005.

During the summer and fall of 1998, 1999, 2000, 2001, and 2003, WDFW inventoried a total of 1,994.33 highway kilometers (1,239.22 miles) within Highway Safety and Mobility projects statewide and evaluated 551 fish-bearing crossings, assessing 174 as fish passage barriers requiring repair (Table 4). For detailed accounts of barriers identified during the 2003 Highway Safety and Mobility project reviews in each region, refer to Appendix 1 (Appendix 1 includes a comprehensive list of barriers identified during the ongoing WSDOT fish passage barrier inventory since 1992 up to March 2004, as well as barriers identified during transportation reviews). Additional data can be obtained by contacting Fish and Wildlife Biologist, Eva Wilder at the WDFW; e-mail: wildeelw@dfw.wa.gov; phone: (360) 902-2411.

Table 4. Summary of Proposed WSDOT Highway Safety and Mobility Projects – Fish Passage Inventory Efforts.

| WSDOT Region | Total Distance Surveyed ¹ (miles) | Fish Crossings | Fish Barriers with Significant Habitat Gain ² |
|---------------|--|----------------|--|
| Northwest | 274.92 | 183 | 63 |
| North Central | 215.33 | 53 | 12 |
| Olympic | 191.22 | 138 | 45 |
| Southwest | 129.88 | 94 | 32 |
| South Central | 349.45 | 69 | 15 |
| Eastern | 78.52 | 14 | 7 |
| Total: | 1239.32 | 551 | 174 |

1 On/ Off ramps were also evaluated, but are not included in the total distance surveyed

2 Represents fish passage barriers that are located within the proposed Safety and Mobility project vicinity.

Barrier Correction in the course of WSDOT Transportation Improvement and Road Construction Projects

Commonly, road culverts require maintenance, or fail completely and require replacement. Work within the ordinary high water marks of flowing streams requires a Hydraulic Project Approval (HPA), which provides WDFW habitat biologists an opportunity to work with WSDOT engineers to correct fish passage deficiencies. In this process, the WDFW's Technical Applications Division (TAPPS) may be contacted to provide detailed stream surveys, identify fish passage barriers, or to provide other pertinent information. WDFW/TAPPS maintains a centralized, statewide, fish passage database, which includes the WSDOT fish passage inventory data. To facilitate planning efforts, WDFW reviews the milepost vicinities of upcoming safety and mobility projects following routine fish passage inventory procedures and makes recommendations on fish passage repairs to the appropriate WSDOT region.

It is important WSDOT notify WDFW/ TAPPS whenever a WSDOT fish passage barrier is scheduled for correction, or has been corrected during road construction or routine maintenance in order for WDFW/ TAPPS to inspect all WSDOT fish barrier corrections and update the fish passage database to reflect the status of corrected WSDOT fish passage barriers.

Consideration of fish passage barrier correction within WSDOT regional safety (I-2) and mobility (I-1) transportation project planning is essential to cost-effective barrier correction. Coordination of barrier correction during routine transportation projects eliminates the cost of road machinery transport and traffic control incurred during barrier correction with Dedicated Funding.

Sixty-nine fish passage barriers were reported corrected by WSDOT during safety and mobility projects since 1982 (see Table 5). During recent road improvement projects, WSDOT in collaboration with Alderbrook Resort, as part of the resort's expansion project, replaced a barrier culvert at a crossing of Dalby Creek and SR 103 (See Figure 15 and 16) and at Upper Springbrook Creek and SR 167 crossing (see Figure 17 and 18). At Deer Creek, WSDOT in collaboration with King County, abandoned a culvert under SR 203, while enhancing downstream habitat with large woody debris (See Figure 19 and 20). Fish passage improvements were also conducted at an unnamed tributary to North Creek, where it crosses SR 527 (Figure 21) and at a crossing of Portage Creek and SR 9 (Figure 22). Another recent fish passage improvement project involved culvert removal on Martha Creek, under I-405. A concrete channel was retrofitted with baffles, while the upstream habitat was enhanced with large woody debris placement in the stream (see Figures 23-25).

Table 5. Fish Passage Projects Completed through WSDOT Transportation Project and Other Funding Sources.

| WSDOT Region | SiteID | Road | Milepost | Stream | Tributary to | WRIA | RM | Funding | Year Fixed | Fish Passage Satisfactory Yes/ No |
|--------------|---------------|--------|----------|--------------------|--------------------|----------|------|---------|------------|-----------------------------------|
| Eastern | 990881 | SR 20 | 380.1 | Unnamed | Lk Thomas | 59 | | TP | | No |
| Eastern | 992006 | SR 21 | 172.17 | Lambert Cr | Curlew Cr | 60.0327 | | OM | 2001 | Yes |
| Eastern | 990350 | SR 20 | 388.13 | Renshaw Cr | Pend Oreille R | 62.0310 | | TP | 1997 | No |
| Eastern | 990351 | SR 20 | 389.50 | Renshaw Cr | Pend Oreille R | 62.0310 | | TP | 1997 | No |
| Northwest | 01.0228 4.80 | SR 542 | 6.55 | Anderson Cr | Nooksack R | 01.0228 | 4.80 | OTH | 2000 | Yes |
| Northwest | 105 R071916a | SR 410 | 48.31 | Boundary Cr | White R | 10.0250 | 0.70 | TP | | No |
| Northwest | 990064 | SR 18 | 19.76 | Carey Cr | Issaquah Cr | 08.0218 | | TP | 1996 | Yes |
| Northwest | 05.0018 2.00 | SR 532 | 6.14 | Church Cr | Stillaguamish R | 05.0018 | 2.00 | OM | 1995 | Yes |
| Northwest | 101S-27 | SR 203 | 12.76 | Deer Cr | Snoqualmie R | 07 | | OTH | 2003 | Yes |
| Northwest | 07.0383A 0.50 | SR 202 | 13.80 | Dry Cr | Patterson Cr | 07.0383A | 0.50 | TP | 1998 | Yes |
| Northwest | 990208 | SR 18 | 12.70 | Jenkins Cr | Soos Cr | 09.0087 | | TP | 2003 | Yes |
| Northwest | 990209 | SR 18 | 13.80 | Jenkins Cr | Soos Cr | 09.0087 | | TP | 2003 | Yes |
| Northwest | 990262 | SR 522 | 2.00 | Maple Leaf Cr | Thorton Cr | 08.0033 | 0.80 | TP | 2002 | Yes |
| Northwest | 993115 | I-405 | 29.67 | Martha Cr | Swamp Cr | 08 | 0.17 | TP | 2002 | Yes |
| Northwest | 990271 | SR 530 | 29.60 | Mc Govern Cr | NF Stillaguamish R | 05.0168 | | TP | 1996 | Yes |
| Northwest | 990272 | SR 104 | 29.65 | McAleer Cr | Lk Washington | 08.0049 | 3.10 | TP | 1995 | Yes |
| Northwest | 990294 | SR 528 | 2.47 | Munson Cr | Allen Cr | 07.0073 | 2.20 | OTH | 2000 | No |
| Northwest | 08.0077 0.20 | SR 527 | 6.57 | Penny Cr | North Cr | 08.0077 | 0.20 | OTH | 1994 | Yes |
| Northwest | 990344 | SR 9 | 28.38 | Portage Cr | Stillaguamish R | 05.0036 | | TP | 2002 | Yes |
| Northwest | 08.0110 0.10 | SR 202 | 11.10 | Rutherford Cr | Evans Cr | 08.0110 | 0.10 | TP | 2002 | Yes |
| Northwest | 990390 | SR 18 | 8.90 | Soosette Cr | Soos Cr | 09.0073 | 1.20 | TP | 1997 | No |
| Northwest | 08.0070A 0.01 | SR 527 | 4.00 | Sulphur Springs Cr | North Cr | 08.0070A | 0.01 | TP | 1995 | Yes |
| Northwest | 990644 | SR 530 | 31.01 | Unnamed | NF Stillaguamish R | 05 | | TP | 1995 | No |
| Northwest | 101S-23 | SR 203 | 7.83 | Unnamed | Harris Cr | 07.0285 | 0.53 | TP | 1998 | Yes |
| Northwest | 991189 | SR 527 | 7.38 | Unnamed | North Cr | 08 | | TP | 2003 | Yes |
| Northwest | 991168 | SR 530 | 31.90 | Unnamed | Stillaguamish R | 05 | | TP | 1995 | Yes |
| Northwest | 991153 | SR 530 | 55.90 | Unnamed | Skagit R | 04.0707 | 0.21 | TP | 1996 | Yes |
| Northwest | 991154 | SR 530 | 55.10 | Unnamed | Sauk R | 04.1062 | | TP | 1996 | Yes |
| Northwest | 991162 | SR 530 | 31.20 | Unnamed | Stillaguamish R | 05.0168X | | TP | 1996 | Yes |
| Northwest | 991519 | SR 18 | 19.59 | Unnamed | Carey Cr | 08.0218A | 0.35 | TP | 1996 | Yes |
| Northwest | 991155 | SR 530 | 54.60 | Unnamed | Sauk R | 04.1064 | 0.30 | TP | 1997 | Yes |
| Northwest | 105 R042117a | SR 164 | 8.20 | Unnamed | White R | 10.0048 | 0.60 | TP | | Yes |

Table 5. Fish Passage Projects Completed through WSDOT Transportation Project and Other Funding Sources.

| WSDOT Region | SiteID | Road | Milepost | Stream | Tributary to | WRIA | RM | Funding | Year Fixed | Fish Passage Satisfactory Yes/ No |
|---------------|---------------|-----------------|----------|--------------------|------------------------|----------|------|---------|------------|-----------------------------------|
| Northwest | 991059 | SR 531 | 8.71 | Unnamed | MF Quilceda Cr | 07.0060 | | OTH | | No |
| Northwest | 995977 | SR 20 | 25.77 | Unnamed | Penn Cove | 06.0003 | 0.01 | TP | | Unk |
| Northwest | 991199 | SR 167 | 23.65 | NF Springbrook Cr | Springbrook Cr | 09.0020 | | OTH | 2003 | Yes |
| Northwest | 994239 | Region driveway | | Yarrow Cr | Lk Washington | 08.0252 | 0.92 | TP | | Yes |
| Olympic | 15.0280 1.00 | SR 308 | 1.15 | Big Scandia Cr | Liberty Bay | 15.0280 | 1.00 | TP | 2002 | No |
| Olympic | 22.0351 0.10 | US12 Brady Lp | 12.48 | Camp Cr | Metcalf Sl | 22.0351 | 0.10 | OTH | 1993 | Yes |
| Olympic | 14.0010 0.10 | US 101 | 356.80 | Countyline Cr | Schneider Cr | 14.0010 | 0.10 | OM | 1985 | Yes |
| Olympic | 990910 | SR 106 | 6.95 | Dalby Cr | Hood Canal | 14 | 0.04 | OTH | 2003 | Yes |
| Olympic | 990121 | SR 305 | 12.80 | Dogfish Cr | Liberty Bay | 15.0285 | | TP | 1998 | Yes |
| Olympic | 990144 | SR 112 | 48.49 | Field Cr | Strait of Juan de Fuca | 19.0026 | 2.10 | TP | 2001 | No |
| Olympic | 991512 | US 101 | 186.70 | Forgotten Marsh | Fuhrman Cr | 20.0237N | | TP | 1997 | Yes |
| Olympic | 990156 | US 101 | 186.40 | Frakker Cr | Bogachiel R | 20.0237O | | TP | 1997 | Yes |
| Olympic | 990164 | US 101 | 186.30 | Fuhrman Cr | Bogachiel R | 20.0237E | | TP | 1997 | Yes |
| Olympic | 14.0009A 0.06 | US 101 | 357.90 | Holiday Valley Cr | Schneider Cr | 14.0009A | 0.06 | OTH | 1986 | Yes |
| Olympic | 15.0051 0.10 | SR 302 | 11.32 | Little Minter Cr | Minter Cr | 15.0051 | 0.10 | OM | 2001 | Yes |
| Olympic | 990249 | US 101 | 174.00 | Lost Cr | Hoh R | 20.0440 | | TP | 1998 | Yes |
| Olympic | 22.0349 0.70 | US 12 | 12.36 | Unnamed | Unnamed | 22.0349 | 0.70 | OTH | 1994 | Yes |
| Olympic | 990716 | US 101 | 186.45 | Unnamed | Frakker Cr | 20.0237X | | TP | 1997 | Yes |
| Olympic | 991295 | SR 105 | 31.10 | Unnamed | South Bay | 22 | | OM | 2000 | Yes |
| Olympic | 991545 | SR 112 | 19.90 | Unnamed | Clallam R | 19.0129A | 0.00 | TP | 2001 | Yes |
| Olympic | 991729 | SR 112 | 19.60 | Unnamed | Clallam R | 19 | | TP | 2001 | Yes |
| Olympic | 991532 | US 12 | 13.80 | Unnamed | Chehalis R | 22.0354 | | TP | | Yes |
| Olympic | 991690 | US 101 | 119.90 | Unnamed | Stevens Cr | 22 | | TP | | No |
| Olympic | 990480 | SR 112 | 49.50 | Whiskey Cr | Strait Of Juan De Fuca | 19.0020 | 1.50 | TP | | No |
| South Central | 990189 | US 97 | 37.14 | Highbridge Springs | Satus Cr | 37 | | TP | 1994 | No |
| South Central | 990409 | SR 410 | 82.80 | Miner Cr | American R | 38.1027 | | TP | | Unk |
| South Central | 990436 | US 97 | 57.20 | Toppenish Cr | Yakima R | 37.1178 | | TP | | Yes |
| South Central | 990440 | SR 241 | 9.20 | Unnamed | Sulphur Cr Wstwy | 37 | | TP | 2002 | Yes |
| South Central | 990861 | US 97 | 49.16 | Unnamed | Satus Cr | 37.0478 | | TP | | Unk |
| Southwest | 990948 | US 12 | 127.44 | Dry Cr | Cowlitz R | 26.1119 | | TP | 1999 | Yes |
| Southwest | 992271 | SR 142 | 3.65 | Knight Cr | Klickitat R | 30.0008 | 0.01 | TP | 2001 | Yes |
| Southwest | 992462 | US 101 | 28.92 | Roaring Cr Sl | Naselle R | 24.0563 | | TP | 1997 | Yes |

Table 5. Fish Passage Projects Completed through WSDOT Transportation Project and Other Funding Sources.

| WSDOT Region | SiteID | Road | Milepost | Stream | Tributary to | WRIA | RM | Funding | Year Fixed | Fish Passage Satisfactory Yes/ No |
|--------------|--------------|--------|----------|--------------|---------------|---------|------|---------|------------|-----------------------------------|
| Southwest | 991698 | US 101 | 24.13 | Unnamed | Willapa Bay | 24.0673 | | OTH | 1999 | Yes |
| Southwest | 992272 | I-5 | 42.40 | Unnamed | Cowlitz R | 26.0129 | 0.11 | TP | 1999 | Yes |
| Soutwest | 30.0068 0.40 | SR 142 | 20.20 | Bowman Cr | L Klickitat R | 30.0068 | 0.40 | TP | 2006 | No |
| Soutwest | 990116 | SR 142 | 5.20 | Dillacort Cr | Klickitat R | 30.0009 | 0.00 | TP | 1998 | Yes |
| Soutwest | 990119 | SR 14 | 55.80 | Dog Cr | Columbia R | 29.0130 | 0.00 | TP | 1998 | Yes |

Funding Codes:

OM - operational maintenance
TP - transportation project
OTH - other

Fish Passage Compliance Codes:

Yes - meets fish passage requirements
No - project does not meet current fish passage requirements
Unkn - fish passage barrier status undetermined

Evaluation of Dedicated Funding Projects, Before and After Barrier Removal

The goal of the evaluation program is to accomplish the following:

- Determine fish utilization upstream and downstream of sites prior to and one year after project construction,
- Evaluate new fish passage projects for design, durability, and efficiency for one year following construction, and
- Long-term effectiveness monitoring of selected sites to evaluate various design options and the changes in fish utilization over an extended period.

Adult spawner surveys are a direct way to determine target species presence or absence above and below a newly completed fish passage installation, or to evaluate a pre-project barrier. Three spawner surveys are conducted per year, for 500 meters below and above the project, or to the confluence with a larger body of water downstream, or to a natural barrier upstream. A hip chain is used to measure 500 meters upstream and downstream and surveyor's tape is placed to mark the limits of the survey area. If the reaches 500 meters below and above the fish passage installation are reaches where fish are not likely to be holding or spawning, the team relocates the survey accordingly.

WDFW evaluates dedicated funding projects to ensure they function properly. All projects completed by WDFW are evaluated for one year following construction. During this period, any design deficiencies are noted and corrected whenever possible. After building a project using dedicated I-4 funding, this one-year tune-up period allows for observation of conditions during high flow months when fish are migrating. An on-site review consists of physical assessment by the WDFW project team to confirm the new fish passage installation is durable and efficient. Project deficiencies are identified and corrected during this period beginning after project construction and ending on December 31 the year following.

If resources allow, adult surveys may be conducted in subsequent years if salmonids are not detected upstream of the fish passage project in the first year after construction.

On a select number of sites, representing various design options, adult spawner surveys and fish passage facility assessments will occur over an extended period. This will provide insight into the long-term adult utilization changes and the durability and efficiency of various design options. These assessments will begin in the fall of 2004.

Appendix V shows the pre-project and post-project spawner surveys conducted in 2003 and early 2004. Two out of 3 of the dedicated funding projects completed in 2003 had adult spawners upstream of the fish passage project. At Silver Creek, four adult coho salmon were counted on December 3, 2003, upstream of the new "stream simulation" culvert. Two spawning coho salmon were observed upstream of an unnamed tributary to Big Creek in December 2003 and January 2004. No fish were observed upstream of the newly retrofitted culvert at Fletcher Creek.

Two coho were observed for the first time upstream of the culvert replaced in 2000 at an unnamed tributary to Stillwater Creek. A large debris jam at the confluence with Stillwater Creek has previously prevented salmonid migration upstream. A decrease in the size of the debris jam

in conjunction with higher flows in 2003 improved the conditions for salmonid migration. Similarly, for the first time in five years, adult coho salmon carcasses were observed upstream of the fishway constructed in 1999 in Tibbetts Creek.

Silver Creek

Before Construction



Figure 9. An oval structural steel plate culvert located on US 12 at a milepost 81.22 was identified as a barrier due to a 2.3% slope and an 0.37 m outfall drop.

After Construction



Figure 10. A large, bottomless precast concrete arch culvert replaced the old steel pipe. The culvert bottom simulates the natural conditions of the creek bed, where the slope inside the culvert matches that of the streambed.

Fletcher Creek

Before Construction



Figure 11. A concrete box culvert located on US 101 at a milepost 167.42 was considered a barrier due to a 2% slope and sheet flow.

After Construction



Figure 12. In 2003, WDFW retrofitted this concrete culvert by installing five steel baffles inside the culvert, reducing velocity and increasing depth.

Unnamed to Big Creek

Before Construction



Figure 13. A single, bed level log control downstream of a double round corrugated steel culvert located on US 101 at milepost 103.65 was installed in 1997. Since the installation, downgrading has occurred downstream of the culvert, creating a drop at the downstream log control, which has gradually increased to 0.5 m.

Unnamed to Big Creek

After Construction



Figure 14. Three log jams were installed downstream of the downstream log control to promote aggradation of the stream channel, and to limit scour at the existing log control. The drop has decreased to a level within WDFW standards for fish passage, due to the retention of bedload material downstream of the culvert.

Dalby Creek

Before Construction



Figure 15. A round, precast concrete culvert located on SR 103 at milepost 6.95 was considered a barrier due to a slope of 3.25 %. The old culvert was also undersized.

After Construction



Figure 16. The new culvert was installed in 2003, in collaboration with WSDOT and Alderbrook Resort, as part of the resort expansion project.

Upper Springbrook Creek

Before Construction



Figure 17. The original arched structural plate steel culvert located on SR 167 at milepost 23.65.

After Construction



Figure 18. A new precast concrete box culvert installed in 2003 replaced the failing steel culvert. The new culvert is set at 0.13% slope and has over 20% of streambed material throughout its length.

Deer Creek

Before Construction



Figure 19. The original round precast concrete culvert, located on SR 203 at a milepost 12.76 was identified as a barrier due to a slope of 2.7%.

After Construction



Figure 20. King County in agreement with WSDOT plugged the old culvert, rerouted the stream and enhanced upstream habitat by anchoring large woody debris with rootwads. King County is anticipating more habitat enhancement and removal of an upstream private culvert in the next biennium.

Unnamed Tributary to North Creek

After Construction



Figure 21. A round corrugated steel culvert located on SR 527 at a milepost 7.38 was replaced in 2003, as part of a road widening project, with a precast concrete box culvert. The streambed material covers 20% of the bottom of the culvert.

Portage Creek

After Construction



Figure 22. A structural plate steel arch culvert located on SR 9 at a milepost 28.38 was replaced in 2002 with a concrete arch with natural streambed material throughout the culvert.

MarthaCreek

Before Construction



Figure 23. A barrier culvert located on I-405 at a milepost 29.67.

MarthaCreek

After Construction



Figure 24. The concrete culvert was removed. The concrete flume was constructed to separate the creek from SR 167 and the fill under I-405. A series of baffles attached to the walls of the concrete flume deflect flow and reduce water velocity throughout the flume.

Figure 25. Large woody debris placed downstream of the concrete flume.

